E83-10047
CR-169563

Quarterly Progress Report

"An Investigation into the Utilization of HCMM Thermal Data for the Descrimination of Volcanic and Eolian Geological Units"

NASA Contract No. NAS5-26728

For the Period February 28, 1981 to August 30, 1982

Accomplishments and Significant Results -

1) Image display system upgrade continues.

2) Work continued on the characterization of fragment/block size distributions in varicus terrain types with emphasis on volcanic terrain,

3) Preliminary analysis of other data sets was carried out with the goal of understanding the ability of different data sets to discriminate geologic unit boundaries, with special emphasis on volcanic terrain.

4) Field work in northern Arizona, southern Utah and correlation with Seasat data (see attachments).

5) Definition of additional CCT's required.

Plans for Next Reporting Period - Continuation of analysis of test site and analysis of new data.

(E83-10047) AN INVESTIGATION INTC THE UTILIZATION OF HCMM THERMAL DATA FOR THE DESCRIMINATION OF VCLCANIC AND ECIIAN GEOLOGICAL UNITS Quarterly Progress Report, 28 Feb. 1981 - 30 Aug. 1982 (Brown Univ.) G3/43

N83-14556

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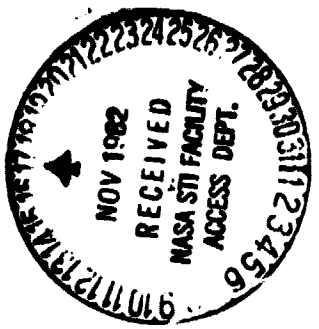

HCMM Progress Report: Re-evaluation of Test Sites

HCMM images of three test sites were originally requested and have been used to assess the potential utility of using thermal images for geological mapping. These test sites were the Craters of the Moon volcanic field in southeastern Idaho, the San Francisco volcanic field in northern Arizona and the High Desert of southern California. During the first year of this grant, as a consequence of an independent collaborative effort with Drs. Blom and Elachi of JPL (which comprised the analysis of Seasat radar images of the Newberry volcano region of southern Oregon), a fourth test site in Oregon and northern California was added.

Analysis of the HCMM data for these four test sites has led to the following observations:

1) The resolution provided by the thermal data is inadequate to permit the identification of individual lava flows within the volcanic test sites. While some flow units can be distinguished from the surrounding terrain, the expected differences between recent and old lava flows, or between aa and pahoehoe surface textures, were not observed. This was particularly true in the case of the Craters of the Moon test site, where the thermal discrimination between the younger flows and the surrounding volcanic terrain has been found to be marginal at best.

2) A similar resolution problem was encountered during the analysis of the thermal data of southern California. Dune complexes at Kelso and Algodomes were found to be too small to permit adequate investigation of their structure.

3) As part of the study of the San Francisco volcanic field, marked variations in the thermal properties of the region between Flagstaff and the Utah State border were observed. Several well-defined units within the Grand Canyon and the Colorado Plateau have been recognised and these units appear to be very suitable for analysis with HCMM, Seasat and Landsat images. Field analyses have been initiated in this area in an attempt to distinguish between the influence of surface geology and vegetation cover.

4) Although individual volcanic constructs within the Cascade Range are too small to permit detailed characterization with the thermal data, the regional volcano/tectonic setting offers a good opportunity for comparing the possible thermal distinction between this area area and sedimentary fold belts such as those found in the eastern United States. Strong intra-regional variations in vegetation cover (probably due to differences in the annual rainfall) were also tentatively identified for the Oregon test site.

As a consequence of these observations, we intend to redirect our future investigations of the thermal data in order to concentrate on the effects of topography, vegetation cover and bedrock geology. The area to the north of Flagstaff, Arizona, including the Grand Canyon-Lake Mead region will constitute the primary test site for assessing the roles of topography and exposed bedrock. Northern California/Oregon and the Appalachians will be investigated to search for differences in the thermal properties of the surface materials within the two contrasting tectonic environments.

In order to complete this analysis, it is requested that additional thermal images of the Grand Canyon site and for the eastern United States be supplied to further study the effects of seasonal variations and bedrock geology on the thermal characteristics of each area. Digital images from the Seasat and SIR-A radar experiments and from Landsat are also requested.

The new data requirements are as follows:

HCMM — Grand Canyon:
DAY-VIS, DAY-IR & NIGHT-IR
DATA ACQUIRED IN JAN→MARCH 1979
CLOUD FREE
CENTERED AT: 36°N, 112°W

EASTERN U.S.:
DAY-VIS, DAY-IR & NIGHT-IR
DATA ACQUIRED IN JULY-SEPT. 1979
CLOUD FREE
2 SETS CENTERED AT: 37°N, 81°W
: 43°N, 73°W

SEASAT — GRAND CANYON:
DIGITAL IMAGE FROM REV. 322
CENTERED AT 36°24'N, 111°50'W

COCONINO PLATEAU:
DIGITAL IMAGE FROM REV. 322
CENTERED AT 35°45'N, 111°20'W

APPALACHIANS:
DIGITAL IMAGE FROM REV. 759
CENTERED AT: 37°N, 81°W
: 43°N, 73°W

LANDSAT — ALL CLOUD FREE

GRAND CANYON:
ID 1464-17354
CENTERED AT 36°24'N, 111°50'W

FLAGSTAFF QUAD:
ID E-769-57CT
(Special U.S.G.S. product)

OREGON:
ID ?
CENTERED AT 43°N, 120°W